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The Characteristics of Mathematics Daily Test Items

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Abstract
The items which are qualified and have good category are obtained through the characteristics of test item analysis. The research aimed to know the characteristics of mathematics daily test items of tenth-grade senior high school. The research used explorative descriptive with a quantitative approach. The data were obtained from the results of 20 test item documentation of 124 tenth-grade students of SMA Marsudirini Bekasi. The daily test was validated by experts and analyzed used classical test theory. The results of this research showed the content validation index was more than 0,8 that test items categorized very valid. The difficulty level index of test items included three categories as big as 20% of test items in easy category, 70% of test items were in the medium category, and 10% of test items were in the hard category. The quality of test items obtained as big as 30% of test items in the adequate category and 70% of test items in the good category.

Keywords: Test theory, daily test, item characteristics.

Introduction

The learning which is qualified needs good preparation and planning. The important aspects in the learning process in Indonesia have been designed in the curriculum. The curriculum is the aspect that is important to the teacher's understanding and student's skills (Murdaningsih & Murtiyasa, 2016). The argument has been verified in the curriculum in Indonesia which is contained in UU Number 20 of 2003 (DPR RI, 2003) concerning National Education System and tells that curriculum is a set of plans and rules about goals, contents, and lesson materials with the manner used as the implementation of learning activity compass for achieving the purposes of certain education.

The change of curriculum in Indonesia becomes a challenge for the educators in preparing for making lesson plans. The curriculum 2013 is a curriculum that is determined in Indonesia nowadays. This curriculum emphasizes the establishment of attitude that creates good behavior, higher-order thinking skills, and other skills for struggling on the global challenge (Retnawati et al., 2017). Specifically, Zulkardi & Putri (Zulkardi & Putri, 2019) argue that the curriculum makes serious efforts to balance three main competencies as the learning outcomes, namely 1) attitude (religious, democratic, responsible, confident, and polite); 2) knowledge (understanding the mathematical concepts); and 3) skills (creativity and innovation). Based on the curriculum model which is developed by TIMSS International Curriculum Analysis (ICA) shows that one of the levels in the curriculum is student's achievement, and it is called attained (Eriksson et al., 2019).

The achievement of students can be obtained from the evaluation of the learning outcomes. This evaluation of the learning outcomes includes the test. Permendikbud Nomor 23 Tahun 2016 (Mendikbud, 2016) says that the test is a process which is done for knowing the achievement of student's competencies as continuing in the learning process for monitoring progress and improve student learning outcome. The test item as a component of the mathematics test is one of the important instruments in the learning process and has to be well structured (J. Owan et al., 2020; Kusumawati & Hadi, 2018).

In this research, the data collected by using the result of the daily tests for Sudut Berelasi material at SMA Marsudirini Bekasi. The analysis of the daily test result showed the proportion of student's learning completeness comprised 28% of students within the complete category and 72% of students within not complete category yet. This result showed that the percentage of students who are not in the complete category was higher than students who are in the complete category. Therefore, the remedial program is

necessary to be given for unfinished students and enrichment program is necessary to be given for students who have completed.

The remedial program is the implementation of completed learning theory in the effort to help students who have not obtained the value which is in standard learning completeness (Izzati, 2015). Based on that judgment, (Rahman & Nasryah, 2019) stated that the forms of the remedial programs include 1) re-learning which utilizes different methods; 2) individual assistance, and 3) giving independent tasks. Meanwhile, enrichment is a given program for students who have already obtained the value with the complete category. Izzati (Izzati, 2015) argued that the implementation of enrichment programs includes 1) giving the assignments to students for reading the next subjects; 2) helping students in solving the addition problems, and 3) helping students who have not obtained in learning completeness.

The learning completeness can be found in the characteristics of test items that are tested. This learning completeness is obtained from the student's ability in solving the test items. The students established error is the response to the test items which are not appropriate with the expected response (Majeed et al., 2021; Ojeda-Hernández et al., 2021). Therefore, this research will discuss the characteristics of mathematics daily test items for Sudut Berelasi material in tenth-grade senior high school by using classical test theory.

Method

The research was explorative descriptive with a quantitative approach. This approach aimed to describe the characteristics of daily test items that are analyzed. The data used in this research was 20 test items with the multiple-choice type in the daily test for sudut berelasi materials. The multiple-choice of test items consisted of 5 choices with 1 choice as a solution and 4 choices as the distractors. The sample were 124 students in tenth grade at SMA Marsudirini Bekasi. The data analysis was done by using classical test theory based on the Quest application. The aims of the analysis were to know the difficulty level and to distinguish the capacity of daily test items that were given.

Results and Discussion

Mathematics daily test items for sudut berelasi material were formulated by lattices. The lattices were made by core competencies and basic competencies that have been formulated in Curriculum as well as Permendikbud Nomor 37 Tahun 2018 (Mendikbud, 2018). The core competencies and basic competencies were formulated to achieve competency indicators that have purposes specifically for knowing students' mathematical ability on sudut berelasi material.

The daily test items formed multiple choices with a singular answer. Every test item did not have relation to all of them so the students answer in the previous test items did not influence the answer of the next test items. The test items which would be examined prior through the content validation step. The content validation was done by experts. The validation aims to know valid or It is not valid before it has been examined to students. The results of content validation showed from experts validation index toward test items. The results of mathematics daily test items validation for sudut berelasi material can be seen on the table I.

Table 1. The Results Of Test Items Validation

Test Items	Validation Index	Category
11, 12, 16, and 17	0.83	Very Valid
1, 5, 7, 10, 13, 19, and 20	0.92	
2, 3, 4, 6, 8, 9, 14, 15, and 18	1.00	

Based on Table 1, all of test items which were formulated in very valid category with validation index 0.83 as 20% (4 test items), 0.92 as 35% (7 test items), and 1.00 as 45% (9 test items). The results of this validation showed that mathematics daily test items for sudut berelasi material could be used in the test. Next, the researcher conducted the item reliability analysis. The reliability analysis aims to determine the level of stability of the measurement test results. The following are the results of the reliability analysis of the items presented in Table 2.

Table 2. The Reliability Analysis Results

Parameter	Index
Mean Test Score	10.73
Standar Deviation	4.80
Internal Consistency	0.85

The reliability of test items was analyzed based on Quest program. The reliability or the consistency in Table 2 showed that the result was 0.85. Then, the test items were analyzed by using classical test theory for determining the characteristics of test items. Here percentage of the analysis of mathematics daily test items characteristics for sudut berelasi material.

Table 3. The Analysis Of Test Items Characteristics Percentage

Difficulty Level	Discrimination Power	
	Good	Good Enough
Difficult	5%	5%
Medium	70%	-
Easy	20%	-

Based on Table 3, the percentage of difficulty level of test items was categorized difficult in the amount of 5% (1 test item) which had good enough quality and 5% (1 test item) had good quality. Besides, the percentage of difficulty level of test items reached 70% and it was categorized good quality. It is caused by 14 test items had medium category of the difficulty level. The other percentage showed that the difficulty level of test items was categorized easy for 4 test items with 20% percentage. Nevertheless, the test items were still in good quality. The parameter of test items with easy category are provided on Table 4.

Table 4. The Test Items With Easy Of Difficulty Level

Test Items	Parameter	
	Difficulty Level	Discrimination Power
1	0.734	0.55
2	0.79	0.43
5	0.75	0.49
6	0.766	0.5

Table 4 showed that the difficulty level of test items for number 1, 2, 5, and 6 were in easy category. It could be known by the parameter advanced of the difficulty level for every test items. The other results explained that the existence of raising parameter from number 1 until 2 was 0.056 and the raising parameter from test item number 5 until 6 was 0.016.

Based on Table 3, there were 2 test items which were in difficult category of the difficulty level. Here the parameter of test items which were in difficult category on Table 5.

Table 5. The Test Items Based On Difficulty Level

Test Items	Parameter	
	Difficulty Level	Discrimination Power
10	0.29	0.30
19	0.282	0.38

Based on Table 5, the test items which were in difficult category include test items number 10 and 19. It happened because the parameter of test items number 10 and 19 continued were 0.29 and 0.282. Nevertheless, those test items had good category with 0.30 of discrimination power and had enough category with 0.38 of discrimination power.

The analysis of the characteristics of test items showed that there were 14 test items (70%) 0f 20 test items which had good quality and 6 test items (30%) which had enough quality. This results were related to the reliability analysis result. The reliability coefficient is defined as the proportion of true score variance to the observed score variance in the classical test theory. This score is obtained through numerical measurements. Retnawati (Retnawati, 2016) states that the reliability (ρ) of a test is defined as a coefficient with a value of -100 ≤ ρ ≤ +100. It means, the high reliability is shown by the high coefficient and the low coefficient explains that the reliability is low. Table 2 showed that the reliability coefficient was 0.85. It was positive and belonged in the high category. It could be concluded that the stability level of test measurement was categorized in the good category. However, there were the test items which had been in criteria and it need researching the test items to be declared as good quality. Sutrisno (Sutrisno, 2016) said that the quality of test items can be increased by checking the conformity between the test items and the lattices.

After checking the conformity of the test items and the lattices, it was obtained some test items which had the similarity of achievement competency indicator between the test item number 1 and 2. The same condition was found between the test item number 5 and 6. Here the test item number 1 and 2 for mathematics daily test in sudut berelasi material for tenth grade at SMA Marsudirini Bekasi.

1. Jika $\sec\alpha = -\frac{5}{4}$ dan $0° \le \alpha \le 180°$ maka nilai $\tan\alpha$ yang memenuhi adalah ....
   A. $\frac{3}{4}$
   B. $-\frac{3}{4}$
   C. $-\frac{4}{3}$
   D. $\frac{4}{5}$
   E. $-\frac{4}{5}$

2. Jika A sudut lancip dan $\sin A = \frac{1}{10}\sqrt{10}$ maka nilai dari $\cos A$ adalah ....
   A. $\frac{1}{3}$
   B. $\frac{1}{10}$
   C. $\frac{3}{10}\sqrt{10}$
   D. $\frac{10}{3}\sqrt{3}$
   E. 3

Figure 1. The test items number 1 and 2

In Figure 1, the test items number 1 and 2 have the similarity of achievement competency indicator, namely finding the concept of angle comparison in quadrant II, III, and IV, especially for special angles. It indicates an increase of students who answer correctly the test item number 2. The students who have answered the test item number 1 correctly have the same opportunity when solving the test item number 2 which has the similarity of achievement competency indicator. In addition, the same condition was found for the test items number 5 and 6. The test items number 5 and 6 are presented in Figure 2.

5. Nilai dari $\cos 265°$ adalah ....
   A. $\cos 85°$
   B. $\cos 75°$
   C. $\cos 65°$
   D. $-\cos 85°$
   E. $-\cos 75°$

6. Nilai dari $\sin 330°$ adalah ....
   A. $-\frac{1}{2}\sqrt{3}$
   B. $-\frac{1}{2}\sqrt{2}$
   C. $-\frac{1}{2}$
   D. $\frac{1}{2}$
   E. $\frac{1}{2}\sqrt{3}$

Figure 2. The test items number 5 and 6

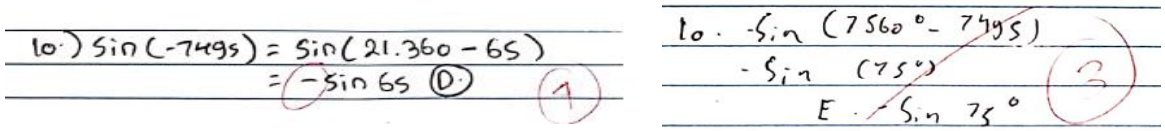
The same condition with the test items number 1 and 2 were indicated by the test items number 5 and 6. The similarity of achievement competency indicator of the test items number 5 and 6 caused an increase correctly answer by students. The indicator which was achieved in the test items number 5 and 6 was finding the concept of angle comparison in the quadrant. It caused the formulated test items had easy category of the difficulty level. Although, the test items number 1, 2, 5, and 6 could still be used as the test sets because it

was still in relatively good quality. This result was shown by the parameter of discrimination power obtained by each items. Retnawati (Retnawati, 2016) states that the parameter value of the discrimination power is said to be good if it is greater or equal to 0.3. Based on Table 3, the discrimination power for the test items number 1, 2, 5, and 6 is greater than 0.3. Therefore, the discrimination power for these items is in the good category and the test items has good quality. The test item is classified to be in the difficult category if the difficulty level parameter is less than 0.5 or close to 0. Based on the results of the characteristics analysis of the test items, there were two of the test items which were in difficult category, items number 10 and 19. The item number 10 is shown in Figure 3.

10. Nilai dari $\sin(-7495°)$ adalah ....
A. $\sin 85°$
B. $\sin 75°$
C. $\sin 65°$
D. $-\sin 65°$
E. $-\sin 75°$

Figure 3. The test item number 10

That item has the difficult category of the difficulty level because the number which is given in the test item is negative and large number. The difficulty level of the test items can be seen from the number of students who answer incorrectly in the item. The students' errors in solving the problems can be classified into 4 types, namely 1) misconception; 2) language misinterpretation; 3) procedural error; and 4) calculation error (Isgiyanto, 2011). However, the results of data analysis showed that the errors found in solving the problems consisted of misconceptions, procedures, and errors in calculation. Here are some mistakes of students in answering the test item number 10.



(a) (b)

Figure 4. The incorrect answer of students

Figure 4(a) showed the student's mistakes in the angle of the actual quadrant. In the test item number 10, the result obtained should be in quadrant IV. Therefore, angle sin is negative. The problem solution of the test item number 10 is sin 65. This is because the angle given to the first problem is negative so the final result has to be positive. Based on Figure 4(b), the student's mistakes lie in misconceptions in solving the problem. As a result, the answers obtained by the students (seen Figure 4(b)), namely –sin 75. However, there are also students who answer the question correctly. One of the students who answered correctly is shown by Figure 5 below.

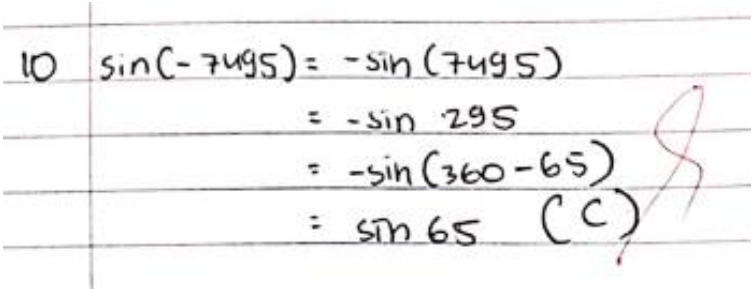


Figure 5. The correct answer by student

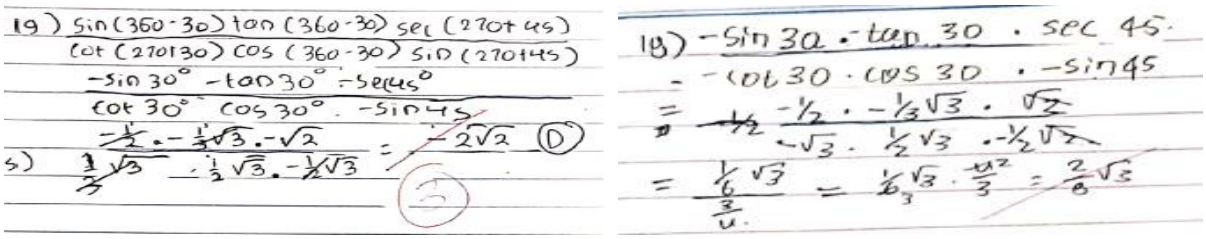
Another test item that have difficult category of the difficulty level is number 19. Here is presented the test item number 19 in Figure 6.

19. Nilai dari $\frac{\sin 330^\circ \tan 300^\circ \sec 315^\circ}{\cot 300^\circ \cos 330^\circ \sin 315^\circ}$ adalah ....

A. 2
B. $2\sqrt{3}$
C. 0
D. $-2\sqrt{3}$
E. -2

Figure 6. The test item number 19

In the test item number 19, the student's errors in answering the question include the errors in calculating and determining the location of the angle given in the appropriate quadrant. The following is an example of student's errors in answering the test number 19.



(a)[1] (b)[2]

Figure 7. The incorrect answer of students

[1]the error in calculating

[2]the error in determining the location of the angle given in the appropriate quadrant.

However, there are also students who answer the questions correctly. The following is an example of one of the student who answer correctly.

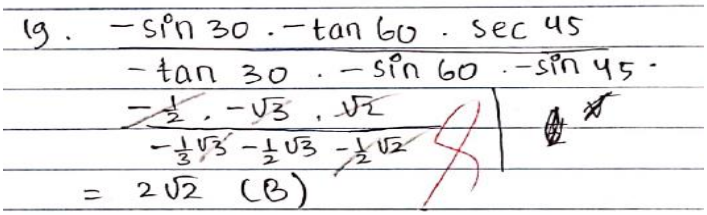


Figure 8. The correct answer of student

Conclusion

The results showed that there were 6 items in good enough quality and 14 test items in good quality from 20 test items of mathematics daily test for sudut berelasi material in tenth grade at SMA Marsudirini Bekasi. The parameter average of the test items difficulty level was 0.536 and it was in good quality. The same results were obtained from the discrimination power aspect. The parameter average of discrimination power was 0.504 and it was also in good category. Based on the results of characteristics analysis of the test items using classical test theory, it could be concluded that the mathematics daily test items for sudut berelasi material had good quality.

Some suggestions for further research are 1) this research results can be a reference for developing the next mathematics daily test so that it can improve the test items which are not in good quality; 2) the development of the test items has to be more various so the interrelatedness between the test items cannot be found relevantly; and 3) the development of the problem has to be related to the core competencies and basic competencies which are formulated in the lattices.

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